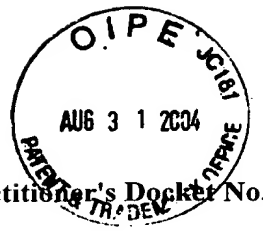
120



AF/2623

Practitioner's Docket No. U 012894-7

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Sharon DUVDEVANI, et al.
Serial No.: 09/633,756 Group No.: 2623
Filed: August 7, 2000 Examiner: Virginia M. Kibler
For: APPARATUS AND METHODS FOR THE INSPECTION OF OBJECTS

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF (PATENT APPLICATION—37 C.F.R. 1.192)

NOTE: The phrase "the date on which" an "appeal was taken" in 35 U.S.C. 154(b)(1((A)(ii) (which provides an adjustment of patent term of there is a delay on the part of the Office to respond within 4 months after an "appeal was taken") means the date on which an appeal brief under § 1.192 (and not a notice of appeal) was filed. Compliance with § 1.192 requires that: 1. the appeal brief fee (§ 1.17(c)) be paid (§ 1.192(a)); and 2. the appeal brief complies with § 1.192(c)(1) through (c)(9). See Notice of September 18, 2000, 65 Fed. Reg. 56366, 56385-56387 (Comment 38).

1. Transmitted herewith, in triplicate, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on June 22, 2004.

NOTE: "Appellant must, within two months from the date of the notice of appeal under § 1.191 or within the time allowed for reply to the action from which the appeal was taken, if such time is later, file a brief in triplicate....." 37 CFR 1.192(a) (emphasis added)

2. STATUS OF APPLICANT

This application is qualified as

[X] other than a small entity.
[ ] a small entity.

RECEIVED
SEP 0 2 2004
Technology Center 2600

CERTIFICATE OF MAILING/TRANSMISSION (37 C.F.R. 1.8(a))

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

☒ deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450.

FACSIMILE

☐ transmitted by facsimile to the Patent and Trademark Office, to (703) 872-9306

Signature

Date: August 23, 2004

JULIAN H. COHEN
(type or print name of person certifying)

3. FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. 1.17(c), the fee for filing the Appeal Brief is:

[ ] small entity	$165.00
[X] other than a small entity	$330.00

Appeal Brief fee due $ 330.00

4. EXTENSION OF TERM

NOTE: 37 C.F.R. § 1.704(b)". . . an applicant shall be deemed to have failed to engage in reasonable efforts to conclude processing or examination of an application for the cumulative total of any periods of time in excess of three months that are taken to reply to any notice or action by the Office making any rejection, objection, argument, or other request, measuring such three-month period from the date the notice or action was mailed or given to the applicant, in which case the period of adjustment set forth in § 1.703 shall be reduced by the number of days, if any, beginning on the day after the date that is three months after the date of mailing or transmission of the Office communication notifying the applicant of the rejection, objection, argument, or other request and ending on the date the reply was filed. The period, or shortened statutory period, for reply that is set in the Office action or notice has no effect on the three-month period set forth in this paragraph."

NOTE: The time periods set forth in 37 C.F.R. 1.192(a) are subject to the provision of § 1.136 for patent applications. 37 C.F.R. 1.191(d). See also Notice of November 5, 1985 (1060 O.G. 27).

NOTE: As the two-month period set in § 1.192(a) for filing an appeal brief is not subject to the six-month maximum period specified in 35 U.S.C. 133, the period for filing an appeal brief may be extended up to seven months. 62 F.R. 53131, at 53156, October 10, 1997.

The proceedings herein are for a patent application and the provisions of 37 C.F.R.1.136 apply.

(complete (a) or (b), as applicable)

(a) [ ] Applicant petitions for an extension of time under 37 C.F.R. 1.136 (fees: 37 C.F.R. 1.17(a)(1)-(5)) for the total number of months checked below:

[ ] Extension (months)	Fee for other than small entity	Fee for small entity
one month	$ 110.00	$ 55.00
two months	$ 420.00	$210.00
three months	$ 950.00	$475.00
four months	$1,480.00	$740.00
five months	$2,010.00	$1,005.00

Fee $ _____

If an additional extension of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

[ ] An extension for _____ months has already been secured, and the fee paid therefor of $ _____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request $_____

or

(b) [X] Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

5. TOTAL FEE DUE

The total fee due is:

Appeal brief fee $ 330.00

Extension fee (if any) $ _____

TOTAL FEE DUE $ 330.00

6. FEE PAYMENT

[X Attached is a check in the sum of $ 330.00
[ ] Charge Account No. 12-0425 the sum of $ _____.

A duplicate of this transmittal is attached.

7. FEE DEFICIENCY

NOTE: If there is a fee deficiency and there is no authorization to charge an account additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in resuming the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to change the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, 1065 O.G 31-33.

[x] If any additional extension and/or fee is required, this is a request therefor and to charge Account No. 12-0425

AND/OR

[x] If any additional fee for claims is required, charge Account No. 12-0425.

Date: August 23, 2004

_____
SIGNATURE OF PRACTITIONER

Reg. No. 20,302

JULIAN H. COHEN
(type or print name of practitioner)

Tel. No.: 212-708-1887

P.O. Address

Customer No.:

c/o Ladas & Parry LLP
26 West 61st Street
New York, N.Y. 10023

OIPE SC181
AUG 3 1 2004
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Sharon DUVDEVANI et al.
Serial No. : 09/633,756
Filed : August 7, 2000
For : APPARATUS AND METHODS FOR THE INSPECTION OF OBJECTS

Group Art Unit: 2623
Examiner: Virginia M. Kibler

Mail Stop Appeal Briefs - Patents
Hon. Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RECEIVED
SEP 0 2 2004
Technology Center 2600

APPEAL BRIEF

Sir:

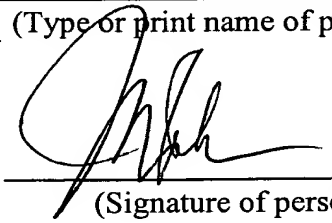
Applicant respectfully wishes to lodge an Appeal against the Final Office Action sent on March 22, 2004, for which the Notice of Appeal was filed on June 22, 2004.

CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Commissioner of Patents and Trademarks, Washington, D.C. 20231

09/01/2004 HGUTEMA1 00000015 09633756
01 FC:1402 330.00 OP

JULIAN H. COHEN
(Type or print name of person mailing paper)



(Signature of person mailing paper)

Date: August 23, 2004

REAL PARTY IN INTEREST

The real party in interest is ORBOTECH, LTD., assignee of all rights to the present Application.

RELATED APPEALS AND INTERFERENCES

There are no other related appeals and interferences known to Applicant or to the real party in interest.

STATUS OF CLAIMS

Claims 1-8 are pending. Claims 4-8 are the original claims as filed. Claims 1-3 have been amended, in response to an Official Action mailed September 29, 2003, which was filed on December 29, 2003. Claims 9-33 have been cancelled.

Claims 1-8 are being appealed.

STATUS OF AMENDMENTS

No amendments have been filed subsequent to the Final Rejection.

SUMMARY OF THE INVENTION

The present invention includes a method for inspecting objects including creating a reference image for a representative object, acquiring an image of an object under inspection, and comparing portions of the image acquired to corresponding portions of the reference image, thereby to identify defects. The reference image includes an at least partially vectorized first representation of boundaries representing the representative object. The acquired image of the object being inspected includes a second representation of boundaries representing the object under inspection. The comparing includes comparing a location of at least some boundaries in the second representation of boundaries to a location of corresponding boundaries in the at least partially vectorized first representation of boundaries.

The inspection methods of the present invention include comparison based inspection in which a region in the image surrounding an inspection trigger is

analyzed and compared to a reference. Comparison is preferably based on a comparison of CELs [contour elements] in the image of the object being inspected 4 to CELs in a reference image for the region correlating to the region triggered as having a suspected defect. (page 23, lines 20-24)

In accordance with a preferred method of comparison, in a learn stage binary CELs in a reference are combined and converted into vector lines comprising directed components. The directed components represent edges between morphological features and substrate in a reference image, and are stored in memory for use during inspection of online images of objects being inspected. CELs and the generation of vectorized line components are described in greater detail with reference to Figs. 21A – 21D of the present application, and the CELs to vector comparison function is described hereinbelow in greater detail with reference to Figs. 30A – 32B of the present application. (page 43, line 27- page 44, line 2)

A CEL is a single directed line defined within a pixel. The location and orientation of a CEL in a pixel is calculated as a function of the difference in gradients of reflection intensity as registered on neighboring pixels. Collections of CELs generally define boundaries between two populations within a pattern formed by a binary image (namely an image that comprises only two populations), and are operative to define the boundary to within a sub-pixel accuracy. (page 50, lines 18-23)

The CEL to Vector comparison function compares reference vectors (polylines) obtained from a reference window to CELs existing in an online image of an object 4 (Fig. 1A) under inspection. Based on the comparison, a determination is made whether a putative defect is a real defect or a false alarm. (page 75, lines 22-25)

In accordance with an embodiment of the invention, the CEL to Vector comparison function preferably proceeds according to the following sequence:

An inspection window, for example an inspection window 1000, is checked for the presence of CELs and to ensure that the number of CELs in the window does not exceed a maximum number of CELs that is permitted to be contained in the inspection window. Preferably, the number of CELs is calculated by counting the midpoint of each CEL.

Inspection window 1000 is checked for the presence of a reference polyline 1010. If inspection window 1000 does not include a polyline 1010, then a defect is returned.

Preferably, polyline 1010 and collections of CELs 1030, 1040 and 1060 are microregistered.

Micro registration preferably proceeds as follows:

Step 1100: each CEL 1110 located in an inspection window 1120 is checked, and those CELs 1110 that are inside one or more envelopes 1130 surrounding reference polyline 1240 are identified and appropriately tagged;

Step 1200: each of the CELs 1110 that are inside an envelope 1130 are checked for direction. Each CEL whose direction, within an angular tolerance range provided by a configuration file based on inspection requirements, is the same as a polyline 1240, is denoted as a "matching" CEL 1210.

Step 1300: A least squares calculation is performed on the distance between each matching CEL 1210 and its neighboring polyline, and the collection of CELs 1210 in the online image is moved relative to polyline 1140 until the value is minimized. When the value is minimized, the images are microregistered, as seen in Fig. 32B.

Following microregistration, a CEL to Vector comparison is conducted as follows:

Envelopes 1030 (Fig. 30A) are constructed around the reference polylines with a width equal to the value of a configuration variable.

Subsequently, CELs 1040 are compared to envelopes 1030. If a CEL 1040 is not found in any envelope a defect is reported. Preferably, each envelope records the number and length of all CELs 1040 that are present inside the envelope 1030. If no CELs are recorded in a given envelope in an inspection window 1000, a defect indicating that the affected envelope is empty is reported for the midpoint of the envelope. (page 76, line 27- end of page 77)

ISSUES

The issues presented for review are as follows.

Applicant believes that the Examiner's understanding of the prior art is incorrect.

If the prior art is correctly understood, the claims are novel and non-obvious over the art cited by the Examiner.

GROUPING OF CLAIMS

The claims have been rejected according to the following groups:

Claims 1 and 2 (rejected under 35 U.S.C. 102(b) as being anticipated by Jacques (FR 2,687,091); and

Claims 3-8 (rejected under 35 U.S.C. 103(a) as being unpatentable over Jacques (FR 2,687,091) in view of Aloni (U.S. 5,619,429)).

ARGUMENT

Claims 1 and 2 have been rejected under 35 U.S.C. 102(b) as being anticipated by Jacques (FR 2,687,091). Claims 3 – 8 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Jacques (FR 2,687,091) in view of Aloni (U.S. 5,619,429). Each of these rejections is treated in a separate sub-section below.

UNDERSTANDING OF THE PRIOR ART

Rejections under 35 USC 102(b) - FR Patent No. 2,687,091 (Jacques)

Claims 1 and 2 have been rejected under 35 U.S.C. 102(b) as being anticipated by Jacques (FR 2,687,091).

The Jacques reference describes a process for computer assisted inspection of cutouts made in a tape by a cutout machine. The inspection method includes extracting contours (boundaries) defining the cutouts and making a polygonal approximation of the cutout. Segments of the polygonal approximation are vectorized, and the series of angles between successive segments are compared with corresponding angles in a theoretical cutout to detect defective cutouts.

The method of Jacques compares corresponding angles in two representations of a reference item. Jacques describes the method as follows:

> The inspection of successive cutouts, which are at least approximately polygonal, made in a tape from successive theoretical cutouts, includes, in a field passed through by the tape as it advances: image acquisition, binarization of this, contour extraction by Freeman coding, and then polygonal approximation. The segments of this polygonal approximation are then vectorized, and the series of angles between successive segments are compared with the series of angles of the theoretical cutouts of the same identification. (Abstract)

Jacques further describes the algorithm on page 6, lines 17 - 18 (of the English translation) as follows: "the series of angles measured in the polygonal approximation is compared with the series of angles of a polygonal approximation of the theoretical cutout of the same identification."

It is therefore clear that Jacques shows comparing a first series of angles to a second series of angles. Jacques does not in any way show or describe "comparing a location of at least some boundaries in the the second representation of boundaries to a location of corresponding boundaries in said at least partially vectorized first representation of boundaries" as required by claim 1.

Thus, as noted hereinabove, claim 1 is distinquished from the prior art because there the comparison is not between a **series of angles of a polygonal approximation**, but rather between the **location** of a **representation of a boundary to the location of a reference boundary**.

This difference, a comparison of a series of angles and a comparison of boundaries, is more than just semantics. For example, when comparison is based on the series of angles, the precise spatial location of the polygon and its size are not evaluated. However, when locations of boundaries in an object to be inspected are compared to the locations of boundaries in a corresponding reference, as claimed in claim 1, subject to a tolerance, the location and size of a polygon, as well as its shape, need to be the same as the reference polygon.

In the Office Action dated March 22, 2004 (paper number 10), the Examiner wrote:

> Regarding claim 1, Jacques discloses a method for inspecting objects including creating a reference image for a representative object, the reference image comprising an at least partially vectorized first representation of boundaries representing the representative object, acquiring an image of an object under inspection comprising a second representation of boundaries representing the object under inspection, and comparing a location of at least some boundaries in the second representation of boundaries to the partially vestorized first representation of boundaries, thereby to identify defects (Abstract).

The Examiner in the "Response to Arguments" section of the above referenced Office Action wrote:

> Applicant describes the inspection method disclosed by Jacques as extracting contours of an object and making polygonal approximation in which the segments are vectorized; the series of angles between the successive segments are compared with corresponding angles in a reference object (Page 4). Comparing a corresponding angle between two edges compares a location of at least some boundaries. Thereby, Jacques meets the claim limitation of comparing a location of at least some boundaries in the second representation of boundaries to a location of corresponding boundaries in said at least partially vectorized first representation of boundaries.

As noted above, the method of Jacques (FR 2,687,091) includes comparing a series of angles between successive segments in polygonal representation of a cutout to corresponding angles in a polygonal representation of a theoretical cutout. Applicant respectfully submits that Jacques (FR 2,687,091) fails to show or suggest comparing a location of at least some boundaries in a representation of boundaries in an object to be inspected to a location of corresponding boundaries in an at least partially vectorized representation of boundaries in a reference object. Applicant respectfully

submits that the **comparison of angles** of Jacques does not, as the Examiner suggests, meet the claims limitation of **comparing a location of at least some boundaries** in the second representation of boundaries to a location of corresponding boundaries in said at least partially vectorized first representation of boundaries.

Rejections under 35 USC 103(a) - FR Patent No. 2,687,091 (Jacques) in view of US Patent No. 5,619,429 (Aloni).

Claims 3-8 (rejected under 35 U.S.C. 103(a) as being unpatentable over Jacques (FR 2,687,091) in view of Aloni (U.S. 5,619,429)).

Jacques (FR 2,687,091) describes a process for computer assisted inspection of cutouts made in a tape by a cutout machine. The inspection method includes extracting contours (boundaries) defining the cutouts and making a polygonal approximation of the cutout. Segments of the polygonal approximation are vectorized, and the series of angles between successive segments are compared with corresponding angles in a theoretical cutout to detect defective cutouts.

Aloni describes apparatus and a method for inspection of a patterned object by comparison of the object to a reference. The apparatus and method include hardware defect detection and software postprocessing.

The features of the present invention discussed hereinabove vis-à-vis Jacques are also applicable to the system recited in claim 3. As discussed hereinabove, the present invention includes, as recited in claim 3, a software candidate defect inspector ... analyzing **a location of boundaries** in a representation of boundaries.

As noted above, the method of Jacques (FR 2,687,091) includes comparing a series of angles between successive segments in polygonal representation of a cutout to corresponding angles in a polygonal representation of a theoretical cutout. Applicant respectfully submits that Aloni (U.S. 5,619,429) fails to show or suggest analyzing a location of boundaries in the representation of boundaries. Applicant thus submits that none of the prior art, alone or in combination, shows or suggests a software candidate defect ... analyzing **a location of boundaries** in a representation of boundaries, as recited in claim 3.

Summary and Conclusion

Applicant respectfully submits that the correct understanding of the prior art method of Jacques clearly describes a method including **comparing angles** and **not comparing boundaries**. Thus claim 1, which includes the recitation of "comparing a location of at least some boundaries in the second representation of boundaries to a location of corresponding boundaries in said at least partially vectorized first representation of boundaries" is not shown or suggested by the prior art cited. Additionally, none of the prior art, either alone or in combination, shows or suggests, "a software candidate defect inspector ... analyzing a location of boundaries," as recited in claim 3.

Inasmuch as claims 1 and 3 are deemed patentable over the cited prior art, Applicants respectfully submit that claim 2, which depends from claim 1, and claims 4 – 8, which depend from claim 3, are also patentable over the cited prior art. Therefore, as discussed hereinabove, all of the claims of the present invention are novel and non-obvious over the art cited by the Examiner.

Respectfully submitted,

JULIAN COHEN
c/o LADAS & PARRY
26 WEST 61st STREET
NEW YORK, N. Y. 10023
Reg. No. 20302 (212) 708-1887

APPENDIX

This Appendix includes all claims in their present state.

1. A method for inspecting objects, the method comprising:

creating a reference image for a representative object, said reference image comprising an at least partially vectorized first representation of boundaries representing said representative object;

acquiring an image of an object under inspection comprising a second representation of boundaries representing said object under inspection; and

comparing a location of at least some boundaries in the second representation of boundaries to a location of corresponding boundaries in said at least partially vectorized first representation of boundaries, thereby to identify defects.

2. A method according to claim 1 wherein the comparing employs a user-selected variable threshold for acceptable distance between corresponding portions of the boundaries in the first and second representations.

3. A system for image processing comprising:

a boundary identifier operative to generate a representation of boundaries of known elements in the image;

a hardware candidate defect identifier operative to identify at least some candidate defects in the image, in hardware; and

a software candidate defect inspector receiving an output from the hardware candidate defect identifier and analyzing a location of boundaries in said representation of boundaries to identify at least one false alarm within said output, in software.

4. A system according to claim 3 wherein the boundary identifier comprises a hardware boundary identifier operative to generate a representation of boundaries of known elements in the image, in hardware.

5. A system according to claim 3 and also comprising a software candidate defect identifier operative to identify additional candidate defects in the image, in software.

6. A system according to claim 5 wherein the software candidate defect inspector also receives a second output from the software candidate defect identifier and uses the representation of boundaries to identify at least one false alarm within said second output, in software.

7. A system according to claim 3 wherein said hardware candidate defect identifier employs said representation of boundaries in order to identify at least some candidate defects.

8. A system according to claim 5 wherein said software candidate defect identifier employs said representation of boundaries in order to identify at least some candidate defects.

9. – 33. (Cancelled)